

## Lesson no. 11 Fenugreek (methi).



It is an annual plant; its Latin name is *Trigonella foenum-graecum* & botanical family is Fabaceae. Its whole plant is edible; it is used as a natural herb since long for many diseases. Its leaves, seeds, root & stem all are used (dried & fresh). It is cooked & eaten as well. It is mentioned in Hadith book of Al-Jawzi (Tibb Al-Nabawi) please refer lesson no. 43 page no. 104 in part 2 of my book.

- **NAMES:**

1. It is called Hulba in Hadees & Arabic (الحلبة)
2. In English it is called as Fenugreek
3. In Hindi & Urdu it is called as Methi.
4. Latin name is *Trigonella foenum-graecum*.

Please visit my website [www.tib-e-nabi-for-you.com](http://www.tib-e-nabi-for-you.com) for detail Islamic study on Fenugreek.

It is mentioned in following books of Hadith (reference are also given as Hadith number) At-tibb Al-Nabawi Al-Jawzi volume 1, page no. 227; Al-tibb Al Nabawi Harful Haa volume no. 1 page no. 230; Majmauz Zawaid 8035. In Hadith it is said that Nabi (saw) guided to use it; companions of Nabi (saw) used it with other herb for illness; Maaz Bin Jabal said if the price of it increase as gold price & if you know the benefits of it, you will purchase for gold price.

- **Fenugreek plant: -**



It is an herbaceous annual plant grown for its properties & health benefits. Its plant have a single stem or may be branched at the stem base; it grows erect, smooth & has a sweet aroma; it grows up to 40 to 80 cm, it is taproot, stem grow up to 50 cm high.

- **Leaves: -**

Its leaves are small & trifoliate with oval leaflets of green to purple colour. The leaves are alternative, compound; grow about 7 to 12 cm long; the leaflets are oval shaped & grows up to 5 cm long hairy on lower surface.

- **Flower: -**



Flowers are papilionaceous, borne in leaf axils, white lemon yellow or purplish blue in colour. They are arranged singly or in little groups of twos. Its corolla may be of 12 to 18mm. Flowers grow in April & may.

- **Seeds: -**



Seeds are 3-8mm long, oblong or square shaped of green olive or brownish colour, with strong spicy odour, seeds has groove in the central part; its taste is bitter.

- **Fruits: -**

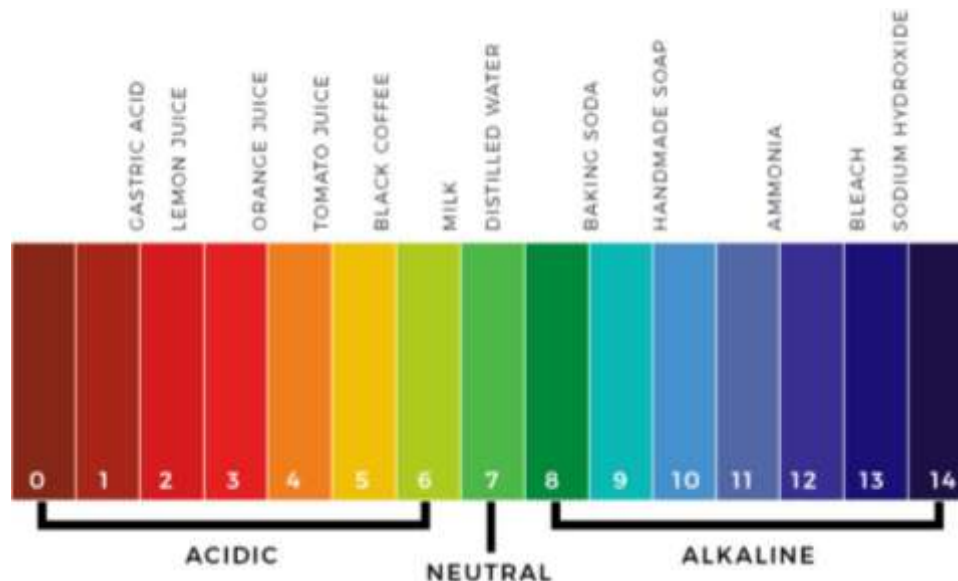
It is straight or sickle shaped, pod of 2 to 10 cm long, thin & pointed; it contain 10 to 20 seeds inside. It has elongated beak at the end; the fruit ripe in summer & are harvested in autumn.

- **pH of Fenugreek is: -** pH of fresh green fenugreek & seeds is 5.3 to 8.2; it is mild acidic or alkaline because its pH is little less or more than 7.

pH is a measure of hydrogen ion concentration, a measure of the acidity or alkalinity of a solution. The pH scale usually ranges from 0 to 14. Aqueous solutions at 25°C with a pH less than 7 are acidic, while those with a pH greater than 7 are basic or alkaline & 7 is neutral; only aqueous solutions have pH levels, vegetable oil has no pH value. Likewise, other oils such as animal and petrochemical oils also have no pH value. Fatty acids are organic molecules often found in foods, including vegetable oils.

The pH of pure water is 7. In general, water with a pH lower than 7 is considered acidic, and with a pH greater than 7 is considered alkaline. The normal range for pH in surface water systems is 6.5 to 8.5, and the pH range for groundwater systems is between 6 and 8.5. We can add normal water to reduce the acidity.

It is Sunnat of Prophet Muhammed (s.a.w) to mixe acidic with Alkaline to make it neutral or less acidic that why He use eat dates with watermelon or cucumber or dry dates with little butter; so you can mix one acidic with alkaline; also it is Sunnat to drink honey mixed in water; also dates or raisins soaked in water over night & drink the syrup (sharbat). Remember do not soak dates & raisin together at one time; soak at separate time & drink.



- **Calories of fenugreek: -**

100 grams of fenugreek seeds gives 323 calories.

100 grams of fenugreek plant gives 49 calories.

- **Glycemic index & Glycemic load of it: -**

Glycemic index of roasted & boiled in water fenugreek seeds is 19 & glycemic load is 6. both are low & good in diabetes.

A food is considered to have a low Glycemic index (GI) if it is 55 or less; mid-range GI if 56 to 69 & high GI if 70 or more. Glycemic index is a number. It gives you an idea about how fast your body converts the carbs in a food into glucose.

A low Glycemic load (GL) is between 1 and 10; a moderate GL is 11 to 19; and a high GL is 20 or higher. For those with diabetes, you want your diet to have GL values as low as possible.

The glycemic load (GL) of food is a number that estimates how much the food will raise a person's blood glucose level after eating it. Glycemic load accounts for how much carbohydrate is in the food and how much each gram of carbohydrate in the food raises blood glucose levels.

- **Gross benefits of fenugreek seeds & fenugreek: -**

Improve hairs quality, prevent hair fall, prevents premature graying of hair, clear's dandruff, improves digestion, reduces cholesterol, controls diabetes, controls weight, reduces menstrual cramps, stops bad breath, reduces labour pain, stimulates insulin, boost testosterone, increase breast milk, enhances breast growth, heals acne, improves skin complexion, relieve symptoms of PCOS, relieves constipation, strengthen the body, heals burn wounds & other lesions of skin, reduces inflammation & best in inflammatory diseases, reduces aluminum toxicity, helpful in dysmenorrhea, increases exercise performance in athletes, improves male fertility, helpful in parkinson's, anti cancer, anti cough & cold, anti gout, helpful in kidney diseases, anti infective, prevent heart for diseases, keeps overall health.

- **Clinical pharmacology of fenugreek seeds: -**

Non-starch polysaccharides (NSP) constitute a significant portion of this fiber content in the fenugreek seeds. Some of major NSP's include saponins, hemicellulose, mucilage, tannin, and pectin. These compounds help lower blood LDL-cholesterol levels by inhibiting bile salts re-absorption in the colon. They also bind to toxins in the food and contribute to protecting the colon mucosa from cancers. NSPs (non-starch polysaccharides) increase the bulk of the food and speed up bowel movements. Altogether, NSPs assist in smooth digestion and help relieve constipation ailments.

Amino acid 4-hydroxy isoleucine in the fenugreek seeds has facilitator action on insulin secretion. Besides, fiber in them slow down the rate of glucose absorption in the intestines and thus helps better regulate blood sugar levels. Fenugreek seeds are therefore one of the recommended food ingredients in the diabetic diet.

It is excellent source of minerals like copper, potassium, calcium, iron, selenium, zinc, manganese, and magnesium. Potassium is an important component of cell and body fluids that helps control heart rate and blood pressure by countering action on sodium. Iron is essential for red blood cell production and as a co-factor for cytochrome-oxidases enzymes. There are many more benefits of it, you can read in separately mentioned below in each contents of fenugreek.

- **Modern uses: -**

**For general health & fitness also for malaria, typhoid & dengue: -**

Take 7 seeds of fenugreek, 7 seeds of black seeds, 3 dates, boil in little water for some time, prepare tea like, filter & add 1 spoon of pure honey & drink the tea 3 times a day till complete recovery; for general health drink it 2 times a week early morning empty stomach regularly.

**For hair, complexion, hormonal imbalance, or gynecological disorders: -**

Take half teaspoon of fenu greek seeds, flex seeds & pumpkin seeds each soak overnight in little water boil it in morning, filter & add 1 teaspoon of pure honey & drink it & eat the soaked seeds, 3 times a day till complete relief then follow up with twice a week lifelong.

Also eat 1 cucumber & 3 dates at evening 6.00pm daily till complete relief then twice a week lifelong.

**For hair problem: -**

Take few fenugreek seeds, 2 spoon aloe vera gel, 2 spoon extra virgin olive oil, half spoon of honey mix all make a paste apply it on hairs for 2 to 3 hours & wash with warm water, apply twice a week for 3 months.

**For preventing diseases: -**

Eat bhaji of fenugreek leaves (whole plant) once or twice a week lifelong add some extra virgin olive oil.

- **Contents/constituents of fenugreek plant & seeds: -**

**All contents may not present in all types of it, because there are many varieties of it according to geographical regions & content may differ a lot as per cultivation, soil, seed, climate etc.**

Leaves have fiber & have fewer ingredients than seeds. Water 9%, carbohydrate, dietary fibre, protein, vitamin B1, B2, B3, B6, B9 (folate), C, calcium, iron, magnesium, manganese, phosphorus, potassium, sodium, zinc, selenium, fructose, choline, diosgenin, trigonelline, 4-hydroxyisoleucine acid, fenugreekine, gitogenin, steroid saponins, glycosides, flavonoids, phytosterol, phenolic compounds like coumarin, rutin, quercetin, luteolin, kaempferol, saponins like graecunin, sapogenin, alkaloids like carpaine, gentianine, tannin, trigonelline, vitexin.

Protein in fenugreek seed endosperm, 100 grams of it contain 44 grams of protein init & 100 grams seeds contain 25 grams of proteins; they are rich in proteins (amino acids) tryptophan, threonine, isoleucine, leucine, Lysine, methionine, cystine, phenylalanine, tyrosine, valine, histidine, arginine, aspartic acid, glutamic acid, glycine, proline, serine; also lecithin, the seeds have 65% dietary fiber in it.

**Active ingredients of fenugreek are steroidal saponins, diosgenin, coumarin, leucine, tyrosine etc.**

A good quality fenugreek seeds contain following amino acids.

Amino acids	Fenugreek seeds
Weight (g)	4 grams
Tryptophan(mg) (% RDI)	14 (5%)
Threonine(mg) (% RDI)	33 (3%)
Isoleucine(mg)	46

(% RDI)	(3%)
Leucine(mg) (% RDI)	65 (2%)
Lysine(mg) (% RDI)	62 (3%)
Methionine(mg) (% RDI)	13 (2%)
Cystine(mg) (% RDI)	14 (5%)
Phenylalanine(mg) (% RDI)	40 (5%)
Tyrosine(mg) (% RDI)	28 (3%)
Valine(mg) (% RDI)	41 (2%)
Histidine(mg) (% RDI)	25 (4%)
Arginine(mg)	91
Alanine(mg)	38
Aspartic acid(mg)	100
Betaine(mg)	~
Glutamic acid(mg)	148
Glycine(mg)	48
Proline(mg)	44
Serine(mg)	45

The above ingredients are based on scientific study, means these has been indentified, known & learnt by modern science, it does not means that it contains only these ingredients, there may be many more ingredients which are yet to be discovered, learnt & known by modern science.

- **Basic pharmacology of contents of fenugreek plant, seed, that are naturally present & not synthetic: -**
- **Luteolin: -**

It is a tetra-hydroxy flavone (flavonoids are polyphenolic compounds); a naturally occurring flavonoid

**Main sources of luteolin: -**

Celery seeds, thyme, green pepper, fenugreek seeds, broccoli, carrot, orange, basil etc.

**Basic pharmacokinetics of luteolin (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research.

**Basic clinical pharmacology of luteolin: -**

It is famous for activities like anti oxidant, anti inflammatory, apoptosis (inducing & chemo-preventive activities), reduces free radicals, oxidative stress, reduces tumour cell growth & suppresses metastasis & cancer growth.

- **Kaempferol: -**

It is a natural flavonol (a type of flavonoid) it is tetra-hydroxy-flavone.

**Main sources of kaempferol: -**

Fenugreek seeds, green tea, grapes, tomato, broccoli, spinach, raspberries, peaches, green beans, onion, potato etc.

**Basic pharmacokinetics of kaempferol (based on human intake in natural food products): -**

It is ingested as a glycoside, absorbed in small intestines usually by passive diffusion; it is metabolized in various parts of the body. In small intestine it is metabolized to glucuronide & sulfo-conjugate by intestinal enzymes & it is also metabolized by colon micro-flora (bacteria) which can hydrolyze the glycosides to aglycones or form simple phenolic compounds. It is mainly metabolized in liver to glucurono-conjugated & sulfo-conjugated form. It is mainly excreted in urine.

**Basic clinical pharmacology of kaempferol: -**



It is anti oxidant, anti inflammatory, anti microbial, anti cancer, cardio protective, neuro microbial, anti diabetes, estrogenic, analgesic, anxiolytic, anti allergic, anti viral etc.

- **Vitexin: -**

It is an apigenin flavone glucoside compound; it is also called Apigenin-8-C-glucoside; it is light yellowish colour

**Main sources of vitexin: -**

Passion flower, hawthorn, bamboo leaves, cucumber, fenugreek, mungs beans, pearl-millet, vitex agnus castus.

**Basic pharmacokinetics of vitexin (based on human intake in natural food products): -**

It has many health benefits like it increases coronary artery blood flow, increase pumping of heart, anti oxidant, controls blood pressure because it is ACE inhibitor, improves low blood pressure, improve exercise capacity. It inhibits thyroid peroxidase thus contributes in goiters.

- **Coumarin: -**

It is oxygen containing heterocyclic compound; it is among polyphenolic compound present in many plants; it is colourless, crystalline phytochemical; it belongs to benzopyrones family; it is found in many essential oils.

**Main sources of coumarin: -**

Fenugreek, cassia cinnamon, vanilla grass, cucumber etc.

**Basic pharmacokinetics of coumarin (based on human intake in natural food products): -**

It is absorbed rapidly in small intestines & metabolized in liver, very less is known about its digestion. It is stored in liver, kidney, brain, heart, lungs, muscles; it crosses the blood brain barrier; it is excreted in urine mainly & little in stool.

**Basic clinical pharmacology of coumarin: -**

It is anti inflammatory, anti tumour, anti bacterial, anti oxidant, anti coagulant etc.

- **Carpaine: -**

It is minor alkaloid that forms major component of papaya leaves which has been studied for its cardio vascular effects.

**Main sources of carpaine: -**

Papaya leaves & seeds, cucumber etc.

**Basic pharmacokinetics of carpaine (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research.

**Basic clinical pharmacology of carpaine: -**

It kills many parasites (bacteria that live for many years in living cells), it is anti bacterial, anti fungal, anti viral, anti inflammatory, increases immune power, improves digestion & liver function, prevent cancer, maintain kidney function, cures dengue, detox the body, controls weight etc.

- **Gentianine: -**

It is water soluble & a strong basic compound, bitter taste found in fenugreek; it is a natural alkaloid.

**Main source of gentianine: -**

Canella oil, tea oil, giant scabious, yellow scabious, dipsacus.

**Basic pharmacokinetics of gentianine (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research.

**Basic clinical pharmacology of gentianine: -**

It is anti diabetes, anti psychotic, anti inflammatory, anti bacteria, anti malaria, anti convulsant, diuretic, reduces blood pressure, reduce heart rate, sedative.

- **Sapogenin: -**

It is lipophilic saponin which protect the plant from bacterial, fungal & other infecting. It is bitter in taste.

**Main sources of sapogenin: -**

Fenugreek seed, desert date, quinoa seeds.

**Basic pharmacokinetics of sapogenin (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research.

**Basic clinical pharmacology of sapogenin: -**

It reduces LDL, cholesterol, reduces bile salt reabsorption in colon.

- **Graecunin B,C,D,E,G: -**

It is found in fenugreek leaves, it is water soluble, it is of many types, referred as B,C,D,E & G; they all belong to natural organic steroidal saponins. It is also present in many herbs & spices. It is excreted in urine. It is under research & very less is known about it currently.

- **Trigonelline: -**

It is a major plant alkaloid beneficial for diabetes & central nervous system diseases. It is a plant hormone that has diverse regulatory function & etc.

**Basic pharmacokinetics of trigonelline (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research.

**Basic clinical pharmacology of trigonelline: -**

It is anti diabetic, anti migraine, sedative, anti viral, anti tumour, anti bacterial, anti cancer, increases memory, reduces platelet aggregation, reduces lipids, it is neuro-protective etc.

- **Tannin: -**

It is of astringent (dry & puckery feeling in mouth) taste, it is a polyphenol present in many plants, fruits, plant's wood, bark, leaves, skin, seeds etc. It is also called as Tannic acid; it is of 2 types hydrolysable & condensed. Hydrolysable is decomposable in water & reacts with water & form other substance. Condensed form is insoluble & precipitates, it is called as tanner's reds. But most of tannic acid is water soluble.

**Main sources of tannin: -**

It is present berries, apple, barley, nut, tea, legumes, grapes, pomegranate, quince, oak wood, lemons, squash etc.

**Basic pharmacokinetics of tannin (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research. After ingestion its bioavailability is poor due to its large size, high affinity to bound to plasma protein & low lipid solubility. It gets hydrolyzed in glucose & release gallic acid & other compounds upon decomposition.

**Basic clinical pharmacology of tannin: -**

It is used internally & externally. Externally it cures & heals the condition when applied on cold sores, fever blisters, diaper rashes, bleeding gums, tonsillitis, skin rashes, white discharge, yellow discharge, minor burn etc. It is used as douche for vaginal disorders like white or yellow discharge.

In food it is used as flavoring agent & naturally present in fruits etc, it relieves & cures chronic diarrhea, dysentery, hematuria (blood in urine), pain in joints, persist cold, cancers etc, it reduces high blood pressure, high lipids in blood. It is anti aging, anti oxidant, anti bacterial, anti enzymatic. It is used in medicated ointments for piles.

If used excessive it can give toxic effects on skin & internally may reduce absorption of vitamin, cause stomach irritation, nausea, vomiting, liver damage, kidney damage. It should not be used in pregnancy, breast feeding & constipation.

- **Quercetin: -**

It is a plant flavonol from the flavonoid group of polyphenols; it is bitter in taste.

**Main sources of quercetin: -**

Red onion, green tea, apples, ginkgo biloba, grapes etc.

**Basic pharmacokinetics of quercetin (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research.

**Basic clinical pharmacology of quercetin: -**

It is good for heart diseases, coronary heart disease, prevents cancer, arthritis, bladder infection, diabetes; it is anti oxidant, anti inflammatory, reduces benign prostatic hyperplasia, cholesterol, blood pressure, asthma, symptoms of rheumatoid arthritis.

- **Rutin: -**

It is also called as Rutoside, it is a citrus flavonoid found in many plants including citrus fruits & it is soluble in water & alcohol.

**Main sources of rutin: -**

It is present in green tea, quince, apple, asparagus, black tea, citrus fruits, grapes, cherries, apricot, noni, leaves of eucalyptus, buck wheat, ginkgo biloba, raisins etc.

**Basic pharmacokinetics of rutin (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are in research.

**Basic clinical pharmacology of rutin: -**

It reduces high blood pressure, bleeding, bleeding piles, it strengthens the blood vessels, it reduces risk of cancers due to its anti oxidant & anti free radicals activity, reduces bruise, inflammation, protects heart, brain etc; it is chelator of metal ions.

- **Choline: -**

It is water soluble vitamin & essential nutrient, it is a constituent of lecithin; it helps in many functions of the body.

**Main sources of choline: -**

It is present in watermelon, egg, peanut, fish, dairy products, wheat, beetroot, spinach, beans, whole grains, grapes etc.

**Basic pharmacokinetics of choline (based on human intake in natural food products): -**

Choline is mostly present in food in free form; it is absorbed in small intestine via transporter proteins & metabolized in liver; excessive choline is not stored but converted into phospholipids; it is changed into Trimethylamine in liver & is excreted in urine.

**Basic clinical pharmacology of choline: -**

It helps the nerves to develop signals. Our body makes some amount of choline, but should be consumed to avoid deficiency; it helps liver function, brain development, muscles movement, cell messenger system, DNA synthesis, nervous system, gall bladder function; it can be taken in pregnancy because it prevents neural tube defect. It aids in fats & cholesterol metabolism & prevent excessive fat building in liver.



- **Flavonols: -**

Flavonols are polyphenols & belong to class of flavonoids; they are colourless molecules that accumulate mainly in the outer & aerial tissues (skin & leaves) of the fruits & vegetables because their biosynthesis is stimulated by light so absent in inner parts of fruits & vegetables. There are more than 7000 flavonoids discovered yet & many more are to be discovered.

**Main sources of flavonols: -**

It is present in tea, leek, onion, broccoli, kale, berries, grapes, quince, cucumber etc.

**Basic pharmacokinetics of flavonols (based on human intake in natural food products): -**

Its absorption, metabolism & excretion in natural form are not yet known & are under research. Flavonoids are mostly absorbed in small intestine, after absorption flavonoids conjugates with glucuronic acid or sulfate or methylation may occur; no free flavonoids are found in plasma or urine except catechin; the part of it which remains undigested is degraded into phenols in colon (large intestines) by microorganisms & absorbed, the absorbed part is further metabolized in liver; it is excreted via urine & bile.

**Basic clinical pharmacology of flavonols: -**

All types of flavonols are anti oxidant, anti inflammatory, anti cancer, reduce oxidative stress, maintains heart health, helpful in asthma, stroke, helps in regulating cellular signaling etc.

- **Phytosterol: -**

It is plant sterol & stanol esters; it is a group of naturally occurring compound found in plant cell membranes. It is structurally similar to our body's cholesterol & it competes with cholesterol during digestion & blocks absorption of it thus reduces blood cholesterol & is good for heart.

**Main sources of phytosterol: -**

Vegetable oil, seeds, nuts, grapes, cereals, nuts, legumes etc.

**Basic pharmacokinetics of phytosterol (based on human intake in natural food products): -**

It is absorbed only in trace amount only; it inhibits the absorption of intestinal cholesterol & biliary cholesterol.

**Basic clinical pharmacology of phytosterol: -**

It reduces cholesterol, risk of coronary heart disease, cancer cells growth, prevent diseases, maintain prostate gland health, it is anti inflammatory, maintain health of nails, hair etc.

- **Phenolic compounds: -**

Phenolic compounds includes simple phenols, phenolic acid, hydroxycinnamic acid derivatives & flavonoids, tannins, etc all are bioactive substances present in plants.

**Main sources of it: -**

Apples, tea, coffee, berries, mango, citrus fruits, plumps, cherries, kiwi, onion, flour of whole wheat, rice, corn, oats etc.

**Basic pharmacokinetics of phenolic constituents (based on human intake in natural food products): -**

They are absorbed extensively & modified in the body & excreted in urine (but it is in research & the complete metabolism will be known after the research). Its storage in the human body is not known.

**Basic clinical pharmacology of phenolic constituents: -**

They are powerful anti-oxidant (prevent cancer and deadly disease) by acting as a free radicals scavengers & radical chain breaker. It prevents heart disease (reduces cholesterol & LDL & prevent hardening of heart arteries-atherosclerosis), metabolic disease, diabetes, cancers of many types (it acts

on anti-oncogenic pathway thus the growth of tumour cells & cancer cells is inhibited), they protect the brain damage; they are anti-microbial specially bacteria of lungs & intestines. They are also metal chelator (metal stabilizer & make metal soluble).

- **Glycosides: -**

Glycosides are organic compound present in plants & animal sources in which sugar group bounded to its carbon are bounded to another functional molecule. When it is hydrolyzed with enzymes give one or more sugar moiety & this is called as glycone. The word glycosides refer to any sugar or group of sugar (lactose, fructose, glucose etc) (please note glucose only is called as glucoside; please see the difference gly & glu).

**Main sources of glycosides: -**

It is present in many plants, fruit, vegetable & herbs & is called with different name as per present in which plant (example: - glycoside present in senna herb is called as sennosides).

**Basic pharmacokinetics of glycosides (based on human intake in natural food products): -**

Its absorption, metabolized & excretion are not yet known & are in research.

**Basic clinical pharmacology of glycosides: -**

It is anti oxidant, anti cancer, anti tumour, anti inflammatory, helpful to liver function, anti viral, anti bacterial, anti fungal, helpful in heart diseases, cardiac arrhythmia, heart failure, congestive heart failure.

- **Fenugreekine: -**

It is present in fenugreek seeds it is newly discovered steroidal saponins; it is under research & very less is known about it.

- **Steroid saponins: -**

It is natural glycosidic compounds of amphiphilic character. It is present in fenugreek, yucca, ginseng, asparagus, yams, alliums, legumes, beans, onion, garlic etc.

**Basic pharmacokinetics of steroid saponin (based on human intake in natural food products): -**

It is poorly absorbed in intestine due to large molecular mass, high hydrogen bonding capacity, unfavourable physicochemical traits, poor membrane permeability, rapid & extensive biliary (stool) excretion many saponins are excreted in urine also.

**Basic clinical pharmacology of steroid saponin: -**

It reduces cholesterol, LDL, increases testosterone, libido & muscle mass; it maintain balance between cellular proliferation & cell death the disturbances in the balance cause severe diseases like cancer etc; it is anti bacterial, anti oxidant, inhibit tumour growth.

- **Diosgenin: -**

It is a phyto-steriod saponin; it is the product of hydrolysis by acids, strong bases or enzymes of saponins. It is abundantly present in plants like wild yam, dioscorea alata, smilax china and fenugreek. It is anti cancer, anti inflammatory, anti infective, reduces lipid, relief's diverticulitis & gall bladder problems, and rheumatoid arthritis.

Wild yam is a plant containing diosgenin, it is often promoted as a natural alternative to estrogen therapy & DHEA (dehydroepiandrosterone) & used for estrogen replacement therapy, vaginal dryness, premenstrual syndrome, menstrual cramps, osteoporosis because it has some estrogen-like activity but it is not converted into estrogen in the body, but can be converted in laboratories for medicinal usage.

Also it can be converted into progesterone in laboratories & use as progesterone replacement therapy & other uses.

- **Gitogenin: -**

It is saponin present in fenugreek; it is not soluble in water & is a very weak acidic compound. It is under research & little is known about it.

- **4-hydroxyisoleucine acid: -**

It is a non-protein amino acid present in fenugreek seeds, it has excellent effects on obesity & insulin resistance on muscles & liver, promote proper insulin release, it acts on glucose & fats metabolism, very helpful in metabolic syndrome (metabolic syndrome is a group of pathologies that includes obesity, glucose intolerance, dyslipidemia & hypertension); it is under research & its absorption, metabolism etc is not known.

- **Potassium: -**

It is a mineral with symbol K & atomic number 19, it is an essential mineral which body cannot prepare; it is necessary for heart, kidney & other organs to function, its low level in body is called as hypokalemia & high level is called as hyperkalemia; it is mostly present inside the cells (intracellular); normal blood range is 3.5 to 5.0 milli equivalents per/liter (mEq/L).

**Main sources of potassium: -**

Potassium is naturally present in banana, orange, dates, raisin, broccoli, milk, chicken, sweet potato, pumpkin, spinach, watermelon, coconut water, white & black beans, potato, dried apricot, beetroot, pomegranate, almond, quince, cucumber etc.

**Basic pharmacokinetics of potassium (bases on human intake in natural food products): -**

It is absorbed in small intestines by passive diffusion; it is stored mostly inside the cell, little in liver, bones & red blood cells. 80 to 90% potassium is excreted in urine & 5 to 20% is excreted in stools, sweat.

**Basic clinical pharmacology of potassium: -**

It is a mineral belongs to electrolytes of the body; it conducts electrical impulses throughout the body & assists blood pressure, normal water balance, muscle contraction, nerves impulse, digestion, heart rhythm, maintain pH balance. It is not produced in our body so we need to consume it through eating; Kidneys maintain normal level of it in the body by excreting excessive amount of it in urine or reabsorb it if the amount is less in the body so that the body may reuse it. Its deficiency may cause weakness, low blood pressure, constipation, nausea, vomiting etc.

Its normal amount in body keeps blood pressure normal; water balance in body normal; prevents heart disease, stroke, osteoporosis, kidney stone etc.

- **Carbohydrate: -**

It is a macronutrient needed by the body, the body receives 4 calories per 1 gram of it; carbohydrates includes sugar, glycogen, starch, dextrin, fibre & cellulose that contain only oxygen, carbon & hydrogen. It is classified in simple & complex; simple carbs are sugar & complex carbs are fibre & starch which take longer to digest. It is basic source of energy for our body.

**Main sources of carbohydrates: -**

It is present in watermelon (little), potato, sweet potato, bread, oats, butter, white rice, whole grain rice, pasta, lentils, banana, pineapple, quince, cucumber etc.

**Basic pharmacokinetic of carbohydrate (based on human intake in natural food products): -**

Its digestion begins in mouth; salivary glands release saliva & salivary amylase (enzyme) which begins the process of breaking down the polysaccharides (carbohydrates) while chewing the food; now the chewed food bolus is passed in stomach through food pipe (esophagus); gastric juice like HCL, rennin etc & eaten material are churned to form chyme in the stomach; the chyme now is passed little by little down into duodenum, pancreatic amylase are released which break the polysaccharides down into disaccharide (chain of only sugars linked together); now the chyme passes to small intestine, in it enzymes called lactase, sucrase, maltase etc breakdown disaccharides into monosaccharide (single sugar) & absorbed in upper & lower intestines, through villi present in small intestine & send into liver through venous blood present into portal veins, as per body's need it is released in the blood stream & pancreas release insulin to use it as source of energy for the body, & extra is stored is converted into glycogen by liver & stored in liver & little is stored in muscles & tissues. Liver can reconverts glycogen in to sources of energy if body lacks for other source of energy, the undigested carbohydrates reaches the large intestine (colon) where it is partly broken down & digested by intestinal bacteria, the remains is excreted in stools.

#### **Clinical pharmacology of carbohydrates: -**

Carbohydrates are main sources of body energy, it helps brain, kidney, heart, muscles, central nervous system to function, it also regulates blood glucose, it acts on uses of protein as energy, breakdown of fatty acids & prevent ketosis. If we eat less carbohydrate it may lead to hypoglycemia, ketosis, frequent urination, fatigue, dizziness, headache, constipation, bad breath, dehydration etc.

Excessive intake of carbohydrates may lead to vascular disease, atherosclerosis (leads to narrowing of arteries, stroke, diabetes, obesity, fatty liver, blood pressure etc.

- **Vitamin C: -**

It is also called as Ascorbic acid; it is an essential water soluble vitamin, very much needed by the body for many functions & absorption etc.

#### **Main sources of vitamin C: -**

It is present in watermelon, citrus fruit, broccoli, cauliflower, sprouts, capsicums, papaya, strawberries, spinach, green & red chillies, cabbage, leafy vegetables, tomato, cereals, quince, cucumber etc.

#### **Basic pharmacokinetic of vitamin C (based on human intake in natural food products): -**

It does not need to undergo digestion, 80 to 90% of it eaten is absorbed by intestine cell border by active transport & passive diffusion & through ion channels it enters the plasma via capillaries. It is very little stored in adrenal glands, pituitary gland, brain, eyes, ovaries, testes, liver, spleen, heart, kidneys, lungs, pancreas & muscles. All together body can store 5 grams of it & we need 200mg/day in order to maintain its normal level & uses, but old, disease person, smokers & alcoholic need more daily value. It is excreted in urine in the form of dehydroascorbic acid changed by liver & kidneys both, but unused vitamin C is excreted intact.

#### **Basic clinical pharmacology of vitamin C: -**

It prevent cough & cold, repairs tissue, acts as an enzyme for certain neurotransmitter, important for immune function, it is a powerful antioxidant (donates electron to various enzymatic & non-enzymatic reactions); body prepares collagen with the help of vitamin c; it is also helpful in Alzheimer's, dementia, acts on iron absorption, it protects the body from oxidative damages, reduces stiffness of arteries, reduces tendency of platelets to clump each other, improves nitric oxide activity (dilatation of blood vessels) thus prevents high blood pressure & heart disease, also prevent eye disease, reduces risk of cataract, prevents the lining of lungs & prevents lung disease, it is a natural antihistamine (anti allergy), eliminates toxins from the body. Deficiency of it causes Scurvy disease (brown spots on skin occurs,

swelling of gums, bleeding from all mucous membrane, spots are more on thighs & legs, the person looks pale, feel depressed, cannot move, loss of teeth, suppurative wounds occur.

- **Vitamin B1 (Thiamin): -**

It is called as Thiamin also; it is a water soluble vitamin, it belongs to B-complex family, it is an essential micro nutrient which cannot be made by our body.

**Main sources of vitamin B1: -**

It is present in watermelon, spinach, legumes, banana, quince, wheat germ, liver, egg, meat, dairy products, nuts, peas, fruits, vegetables, cereals, rice, breads, oats, cucumber etc.

**Basic pharmacokinetic of vitamin B1 (based on human intake in natural food products): -**

Intestinal phosphatases hydrolyze thiamin to make it free & absorbed in duodenum, jejunum mainly through active transport in nutritional doses & passive diffusion in pharmacological doses, very little is known about its absorption; it is metabolized in liver; it is excreted in urine & stored little in liver, heart, kidney, brain, muscles.

**Clinical pharmacology of vitamin B1: -**

It is needed for metabolism of glucose, amino acids (proteins), lipids (fats) etc; every cell of the body require it to form ATP (adenosine triphosphate) as a fuel for energy, also it enables the body to use carbohydrates as sources of energy; also nerve cells, heart cells, muscles cell require it to function normally; its deficiency causes beri-beri heart disease, weight loss, confusion, malaise, optic neuropathy, irritability, memory loss, delirium, muscles weakness, loss of appetite, tingling sensation in arms & legs, blurry vision, nausea, vomiting, reduce refluxes, shortness of breath etc; it is helpful to immune system; excessive intake of carbohydrates, protein, glucose (speacially in body builders, athletes etc) increases the need of vitamin B1.

- **Vitamin B2: -**

It is also called as Riboflavin, it is a water soluble vitamin, it is an essential micro nutrient, it helps many systems of the body; it is not synthesized in human body.

**Main sources of vitamin B2: -**

It is present in watermelon, liver, milk, dairy products, nuts, egg, fish, leafy vegetables, almonds, mushroom, lean meat and quince, cucumber.

**Basic pharmacokinetic of vitamin B2 (based on human intake in natural food products): -**

It is phosphorylated in the intestinal mucosa during absorption; mainly absorbed in upper gastrointestinal tract; the body absorbs little from a single dose beyond of 27mg; when excessive amount is eaten it is not absorbed; very little is known about its absorption. The conversion of it into its coenzymes takes place mainly in cells of small intestines, heart, liver, kidneys & throughout the body in many cells; it is excreted in urine & stored little in liver, heart, kidneys & in tissues of the body.

**Basic clinical pharmacology of vitamin B2: -**

It is needed by the body to keep skin, eyes, nerves, red blood cells healthy, it also helps adrenal gland, nerve cells, heart, brain to function; it also act in metabolism of food, amino acids (protein), fats, helps to convert carbohydrate into energy (Adenosine triphosphate formation- the energy body runs on). It plays an important role in functioning of mitochondria.

Its deficiency is called as Ariboflavinosis & causes weakness, throat swelling, soreness of mouth & tongue, cracks on skin, dermatitis, anemia, weak vision, itching & irritation in eyes, migraine.

- **Vitamin B3: -**



It is called as Niacin or Nicotinic acid; it is in 2 forms niacin & nicotinamide acid; it is water soluble vitamin; it is an essential micro nutrient; it plays a role in over 200 enzymatic reactions in the body; It is produced in the body in small amount from tryptophan which is found in protein containing food & sufficient amount of magnesium, vitamin B6 & B2 (are needed to produce it).

**Main sources of vitamin B3: -**

It is present in watermelon, green peas, peanuts, mushroom, avocados, meat, egg, fish, milk, cereal, green vegetables, liver, chicken, coffee, potato, corn, pumpkin, tomato, almonds, spinach, enriched bread, carrots, quince, cucumber etc.

**Basic pharmacokinetic of vitamin B3 (based on human intake in natural food products): -**

If eaten in natural form it is absorbed in stomach & small intestines by the process of sodium-dependent carrier-mediated diffusion in 5 to 20 minutes; if taken in therapeutic doses get absorbed by passive diffusion in small intestines. Its uptake in brain requires energy, in kidneys & red blood cells requires a carrier. It is metabolized in liver in 2 ways either is conjugated with glycine or niacin is form into nicotinamide; it is stored little in liver unbounded to enzymes. It is excreted in urine.

**Basic clinical pharmacology of vitamin B3: -**

It regulates lipid level in the body; it acts on carbohydrate to form energy sources for the body, it ease arthritis, boost brain function, every part of body needs it to function properly, it helps convert food into energy by aiding enzymes & cellular metabolism, it acts as an antioxidant. It prevents heart disease. Deficiency of it causes pellagra, high blood cholesterol, memory loss, fatigue, depression, diarrhea, headache, skin problems, lesion in mouth, tiredness etc.

- **Vitamin B6: -**

It is also called as pyridoxine; it is involved in many aspects of macronutrients metabolism; it is present in many food products naturally.

**Main sources of vitamin B6: -**

It is present in watermelon, quince, chicken, bread, egg, vegetable, soyabean, whole grain cereals, brown rice, fish, legumes, beef, nuts, beans, liver, citrus fruits, starchy vegetables, potato, cucumber etc.

**Basic pharmacokinetic of vitamin B6 (based on human intake in natural food products): -**

It is absorbed in small intestines, but before absorption a phosphate group has to be removed making vitamin B 6 in free form & absorbed by passive transport, now reaches liver via portal vein, in liver to get metabolized & flown into the blood stream it is bound with albumin & some are taken up by red blood cells, once getting in blood it can function & promote health & it is excreted mainly in urine & little is excreted in stools, it is very little stored in tissues, muscle tissues, liver, brain, kidneys, spleen.

**Basic clinical pharmacology of vitamin B6: -**

It is needed for proper development & function of brain in children; it is needed for neurotransmitter, histamine, haemoglobin synthesis & function. It serves as coenzyme (cofactor) for many reactions in the body, it is the master vitamin for processing amino acids & some hormones, it is needed by the body to prepare serotonin, melatonin & dopamine, it is better to intake it during treatment of tuberculosis. It supports adrenal glands to function; it acts as a coenzyme in the breakdown & utilization of fats, carbohydrates, protein, it is important for immune system, it helps in treatment of nerve compression like carpal tunnel syndrome, premenstrual syndrome, depression, arthritis, high homocysteine level, diabetes, asthma, kidney stones etc.

Its deficiency causes seborrheic dermatitis (eruption on skin), atrophic glossitis with ulceration, conjunctivitis, neuropathy, anaemia etc.

- **Folate (vitamin B9): -**

Folate is an essential micro nutrient, it is a natural form of vitamin B9, it serves many important functions of the body, it plays an important role in cell growth & formation of DNA, RNA & other genetic material & helps in treating many diseases; its name is derived from Latin word Folium, which means leaf, leafy vegetables have it in good amount; Folic acid is a synthetic form of vitamin B9.

**Main sources of folate: -**

It is present in watermelon, quince, dark green leafy vegetables, fruits, nuts, beans, dates, seafood, egg, dairy products, meat, chicken, legumes, beetroot, citrus fruits, broccoli, spinach, cereals, cucumber etc.

**Basic pharmacokinetic of folate (based on human intake in natural food products): -**

Its absorption is complicated because folate present in food are of many different forms, some of which cannot be absorbed until broken down by intestinal enzymes; it is not absorbed more than 50%; dietary folate contains glutamate that need to separate it from glutamate before absorption starts; It is absorbed in duodenum & jejunum, after absorption it is converted into tetrahydrofolate (the active form of folate), then a methyl group is added to it to form methyltetrahydrofolate; now the body uses it for various functions & metabolism; the body can store folate 20-70mg in liver which is enough for 3 -6 months for the body; it gets excreted in urine & little in stools & bile.

**Basic clinical pharmacology of folate: -**

It is needed by the body to make DNA, RNA & other genetic material; it prevents many disease & conditions like anaemia, stroke, cardiac diseases, cancers, neurological diseases, macular degeneration (eye disease), palpitation, sores in mouth & tongue, hair fall, graying of hair. It is important in fertilization in male & female, essential during pregnancy to prevent neural tube defect in embryo (it is needed more), it protect us from free radicals & oxidation thus prevent cancers, it is essential in red blood cells formation, reduces high levels of homocysteine.

Its deficiency may cause anaemia, tiredness, palpitation, breathlessness, hairfall, neural tube defect in baby during pregnancy etc.

- **Sodium: -**

Here we are learning natural sodium, its symbol is Na & atomic no. 11; it is not produced in the body we need to take it in food sources; it is an important & essential mineral on which our body functions; it regulates blood pressure, blood volume etc.

**Main sources of sodium: -**

Excessive intake of sodium should be avoided; cucumber has very less amount of sodium; vegetables & fruits have less sodium in them which is good for the body. It is present in beans, meat, fish, chicken, chilli, bread, rolls, milk, celery, beetroot etc.

**Basic pharmacokinetic of sodium (based on human intake in natural food products): -**

It is absorbed in ileum by active sodium transport because it is impermeable & in jejunum absorption takes place via mediated active transport & depends on levels of water, bicarbonate, glucose, amino acids etc; its absorption plays an important role in the absorption of chloride, amino acids, glucose & water; similar mechanism are involved in the reabsorption of it in kidneys when its level in the body falls. It is excreted mainly in urine, little in sweat & stools. It is stores in bones & dissolved in various body fluids.

**Basic clinical pharmacology of sodium: -**

It is amongst the essential electrolyte within the body, it remains in extracellular fluid (outside the cell) mainly, it carries electrical charges within the body, kidney maintain its normal level in the body, normal level is 135-145 milli-equivalent per liter (mEq/L), it is not produce in the body, it acts on muscles contraction, nerve cells, regulates blood pressure, blood volume; it takes part in every function of the body mostly, its low level in body is called as hyponatremia, it is found more in older aged, kidney

disease, heart disease, hospitalized patient, this condition may cause brain edema, low blood pressure, fatigue, tiredness etc; its high level in the body is called as hypernatremia may cause increase in blood pressure, thirst, confusion, muscle twitching or spasm, seizures, weakness, nausea, loss of appetite, swelling in body etc.

- **Calcium: -**

It is natural essential mineral for the body, it is among the electrolytes of the body; its symbol is Ca & atomic no. 20.

**Main sources of calcium: -**

It is present in watermelon, quince, milk, banana, cheese, green leafy vegetables, soya beans, nuts, fish, meat, egg, bread, flour, yogurt, almonds, kale, soybean, spinach, cucumber etc.

**Basic pharmacokinetics of calcium (based on human intake in natural food products): -**

Calcium is absorbed in duodenum & upper jejunum (when calcium intake is low) by transcellular active transport process, this depends on action of calcitriol & intestinal vitamin D receptors & when calcium intake is high, absorbed by paracellular passive process throughout the length of small intestine by 3 major steps, entry across the brush border, intracellular diffusion via calcium-binding protein & extrusion; Vitamin D is necessary for absorption of calcium, also vitamin C, E, K, magnesium & exercise increases the absorption of calcium. Also the level of calcium is regulated by calcitonin released by thyroid gland it reduces calcium level in blood when it is excessive & increases the excretion of calcium via kidneys; Parathyroid hormones (PTH) released by parathyroid gland increases the blood level of calcium when body need it or calcium is less in blood & promotes reabsorption of it in kidneys (calcitonin & PTH both have opposite function). Intestines can absorb 500 to 600 mg of calcium at a time; it is mostly stored in bone tissues & teeth & excreted in stool & sweat & little in urine depended upon the level of it in blood. Also estrogen act on transport of blood calcium in bones thus women mostly suffer from osteoporosis after menopause.

**Basic clinical pharmacology of calcium: -**

Calcium acts on bone health, communication between brain & other parts of the body, muscles contraction, blood clotting; it is a co-factor for many enzymes, it relaxes the smooth muscles & blood vessels; it maintains heart rhythm, muscles function; it is more needed in childhood & deficiency of it in childhood may cause convulsions (seizure); Excessive level of it in blood is called as hypercalcemia & may lead to kidney stone formation, heart attack, stroke, loss of appetite, excessive urination, memory loss etc; its low level in blood is called as hypocalcemia & may lead to cramps in the body, weak bones, weak teeth, numbness, tingling etc.

**Contraindication: -**

Sarcoidosis, excessive level of calcium in blood, very severe constipation, kidney stones, increased activity of parathyroid gland etc. Hypersensitivity of calcium, severe cardiac diseases, hypercalcemia, hypercalciuria, severe kidney stones etc.

- **Iron: -**

It is an essential mineral for our body; its symbol is Fe & atomic no. 26; it is an important component of hemoglobin (hemoglobin binds oxygen in lungs & supply it to whole body, it is oxygen carrier).

**Main sources of iron: -**

It is present in watermelon, quince, meat, dates, spinach, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, chicken, legumes, fish, banana, cabbage, kidney, almonds, cucumber etc.

Meat is the best source of iron, it provides Fe<sup>+2</sup> directly which can be transported from intestine to blood stream through Fe<sup>+2</sup> transporter ferroportin (this binds with transferring & delivered into tissues).

### **Basic pharmacokinetics of iron (based on human intake in natural food products): -**

The absorption of iron is not known fully; about only 10% of iron taken in food is absorbed; it is absorbed in duodenum & upper jejunum mainly & at the end part of ileum; low pH is needed for its absorption, after absorption it get bind to transferring (each transferring can carry 2 atoms of iron); ceruloplasmin (protein) also helps in binding of iron; Hepcidin a hormone produced by liver is released when iron stores are full & inhibits iron transport & binding, thus reduces the absorption of iron; vitamin C & copper enhances iron absorption.

### **Storage of iron: -**

Iron is stored in liver (in hepatocytes & kupffer's cells) kupffer's cells play an important role in recycling body iron, they ingest aged RBC liberate iron for it & reuse by breaking down heamoglobin. Little iron is stored in liver, heart, & kidneys in form of ferritin also little in bone marrow, spleen.

### **Excretion of iron: -**

The body does not possess a physiological mechanism for regularly eliminating iron from the body because most of it is recycled by liver cells; iron is lost within cells, from skin & interior surface of the body (intestines, urine, breathe).

### **Basic clinical pharmacology of iron: -**

It is an important component of Haemoglobin (heamoglobin bind oxygen in lungs & supply it to whole body); iron is beneficial for nails, hair, skin etc; it acts on blood production, its deficiency causes Anaemia (low haemoglobin level in blood) (this causes reduced in oxygen carrying capacity & supply of it); most of the iron is present in haemoglobin, it consist of one heme (iron), one protein chain (globin) this allows it to bind & load oxygen from the lungs & supply it to whole body.

Unbounded or free iron is highly destructive & dangerous it can trigger free radical activity which can cause cell death & destroy DNA.

- **Magnesium: -**

It is an important essential mineral; its symbol is Mg & atomic no. 12; it is a co-factor for more than 300 enzymes that regulates functions in the body. Its normal range in blood is 0.75 to 0.95 millimoles (mmol)/L.

### **Main sources of magnesium: -**

It is present in watermelon, quince, spinach, meat, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, dates, chicken, fish, legumes, cucumber etc.

### **Basic pharmacokinetics of magnesium (based on human intake in natural food products): -**

It is absorbed about 20 to 50% only; it is absorbed about 40% in distal intestine when the level of it is low via passive paracellular transport & about 5% in descending colon when the level of it is high via active transcellular transport. Vitamin D increases its absorption & also acts on its excretion in urine. It is excreted in urine & stool; it is stored in bones.

### **Basic clinical pharmacology of magnesium: -**

It is a co-factor for more than 300 enzymes that regulates functions in the body. It act on protein synthesis, muscles & nerve function, blood glucose, control blood pressure, it is required for energy production, bone development, synthesis of DNA & RNA. It also plays a role in active transport of calcium & potassium ions, muscles contraction, normal heart rhythm etc.

- **Phosphorus: -**

It is an essential mineral; its symbol is P & atomic no. 15, it is needed for many parts & functions of the body.

### **Main sources of phosphorus: -**

It is present in watermelon, quince, meat, nuts, beans, fish, chicken, dairy products, soy, grains, lentils, cucumber etc.

### **Basic pharmacokinetics of phosphorus (based on human intake in natural food products): -**

It is absorbed 70-85%, it is absorbed 30% in duodenum, 20% in jejunum, 35% in ileum; it is absorbed in inorganic phosphate form by 2 separate process first when the phosphorus intake is high mainly after meals by paracellular sodium independent passive diffusion pathway & second is transcellular sodium dependant carrier-mediated pathway this falls under the control of vitamin D & etc. When calcium level is too high in the body phosphorus is less absorbed, optimum calcium : phosphorus ratio is helpful in its absorption (excess of anyone decreases the absorption of both). It is stored in bones 85% & rest in tissues; it is excreted 80% in urine & rest in stools (excretion of it is a regulatory action of parathyroid hormone (PTH), vitamin D, and fibroblast).

### **Basic clinical pharmacology of phosphorus: -**

It is present in nature combined with oxygen as phosphate. It acts on growth of teeth, bones, repairs of cells & tissues. It plays an important role in metabolism of carbohydrate, fats, protein & ATP. It works with B-complex vitamins & helps kidney function, muscles contraction, normal heart beats, nerve impulse etc.

- **Zinc: -**

It is a trace mineral; symbol is Zn & atomic no. 30; it is necessary for human body as it plays vital role in health.

### **Main sources of zinc: -**

It is present in watermelon, quince, meat, fish, legumes, beans, egg, dairy products, seeds, nuts, whole grains, cucumber etc.

### **Basic pharmacokinetics of zinc (based on human intake in natural food products): -**

It is absorbed 20 to 40%, its absorption depends on its concentration & is absorbed in whole intestines (jejunum has high rate of its absorption) via carrier-mediated mechanism, it is released from food as free ions during digestion. Zinc from animal sources is easily absorbed comparing to plants sources. It is present in bile & pancreatic juices which is released in duodenum & is reused by the body this is called as endogenous zinc & zinc present in food sources is called as exogenous zinc. Its absorption depends on 2 proteins- Albumin & metallothionein. Albumin enables zinc to be transported from plasma into enterocytes. It is stored in muscles, bones mainly & little in prostate, liver, kidneys, skin, brain, lungs, heart & pancreas. It is excreted in stools 80% & rest in urine & sweat. Metallothionein binds to zinc to make it unavailable & excrete it in stools when zinc is excess in the body, & production of metallothionein is reduced when zinc is less in the body to make zinc available for the body.

### **Basic clinical pharmacology of zinc: -**

It is necessary for immune system, prevents skin diseases, heal skin diseases, helps stimulate activity of at least 100 different enzymes in the body; it is required in little amount in the body, but children, pregnant & old aged need it more. It promotes growth in children, synthesize DNA & acts on wound healing, it is best in treating initial diarrhea & cold cough. It improves learning, memory, fertility etc. It heals acne, attention deficit hyper activity disorder (ADHD), osteoporosis, pneumonia etc.

- **Manganese: -**

It is an essential mineral & micro nutrient, needed by the body for proper health. Its symbol is Mn & atomic no. 25.



### **Main sources of manganese: -**

It is present in watermelon, nuts, beans, legumes, brown rice, leafy green vegetables, pineapple, beetroot etc.

### **Basic pharmacokinetics of manganese (based on human intake in natural food products): -**

It is absorbed 40%, it is absorbed more in women than men; if intake of it is more, than absorption is less & if intake is less, absorption is more; its absorption takes place in small intestines, after absorption it is bounded to blood protein transferring & transmanganin & transport via blood stream to tissues; it is absorbed by inhalation & dermal (skin) also; it crosses brain blood barrier. It is stored in bones, liver, kidney, pancreas; it is excreted mainly in bile & stools, little in urine & sweating; unused manganese is transported to liver for excretion & excreted via bile mainly.

### **Basic clinical pharmacology of manganese: -**

It is needed for proper health of skin, bones, cartilage etc; it helps in glucose tolerance, regulates blood sugar, reduces inflammation, reduces premenstrual cramps, it also aids in formation of connective tissues, bones, sex hormones, blood clotting, metabolism of carbohydrates & fats; it facilitates calcium absorption.

- **Sugar (fructose): -**

Sugar present in beetroot is fructose; (but diabetic patients should not eat much of it).

### **Main sources of fructose: -**

It is present in watermelon, honey, banana, apple, mango, cherry, strawberry, orange, kiwi, pears, pomegranate, apricots, carrots, yogurt, bread, lemon, lime, green beans, beetroot etc.

### **Basic pharmacokinetics of fructose (based on human intake in natural fruit & food products): -**

Fructose digestion begins in the small intestine (more in upper jejunum) via active transport or facilitated transport (not known properly). Our body cannot absorb intact polysaccharide molecules. Therefore, if fructose is present in the form of sucrose, sucrase, an enzyme, must first break up sucrose into separate glucose and fructose components. Single fructose molecules then enter the lining of the small intestine through a special channel and exit out the other side into the bloodstream, once in the bloodstream, fructose travels with all other absorbed nutrients to the liver for metabolism and processing.

### **Metabolism: -**

Fructose metabolism occurs entirely in the liver. Through a complicated process called fructolysis, fructose undergoes several chemical and structural changes with the help of aldolase B (an enzyme in the liver).

Extra fructose needs to be changed into glycogen by liver & stored in liver, once the storage is full in liver then liver convert it into triglycerides & triglycerides are further converted by liver into very low-density lipoprotein (VLDL) & stored in fat cells & muscles. Excessive fructose is excreted in urine.

### **Basic clinical pharmacology of fructose: -**

Fructose has low glycemic index & results in moderate release of insulin in the blood stream relative to glucose & sucrose; fructose gives the least dental caries among other types of sugars, fructose is more sweeter than other types of sugar; it does not raises blood sugar much as glucose does, it is used as sources of energy in the body, excessive intake of it may cause fatty liver, metabolic disorder, blood pressure, increase lipids, increase in uric acid level, increase in free radicals etc.

- **Dietary fibre: -**

It is an eatable part of vegetables & fruit; our body cannot digest it just passes the small intestines & colon & excrete in stools; it is of two types 1) soluble fibre 2) insoluble fibre.

Soluble fibre dissolve in water & form a gel like material & helps in controlling blood cholesterol & blood glucose; it is found in apple, carrot, barley, oats, peas, beans watermelon etc.

Insoluble fibre do not dissolve & promotes excretion & increase bulk of the stool thus relief constipation & helps in elimination of toxins also. It is found in wheat flour, beans, cauliflower, potato, green beans, watermelon, beetroot, beet leaves etc.

This is the reason it is helpful in constipation conditions, it can eaten in pregnancy to relief constipation and get other benefits of it also.

**Basic pharmacokinetics of dietary fibre (based on human intake in natural food products): -**

Soluble fibres get dissolve in water & become a gelatinous substance; do not get digested; it helps to slow the digestion & help the body to absorb vital nutrient from eaten food.

Insoluble fibres do not dissolve in water but remain in fibrous form, and do not get digested; it helps the food pass through the digestive sytem and increase the bulk of stool & eliminate toxins also.

**Basic clinical pharmacology of dietary fibre: -**

It helps in slow down the digestive process thus gives a good control in blood glucose, improves insulin sensitivity, reduces risk of diabetes, maintains weight, helpful in obesity, reduces blood pressure, reduces cholesterol, reduces inflammation, reduces risk of heart disease, relieves constipation thus helpful in piles, fistula & other rectal disorders & disease, improves bowel movement thus improves bowel health, slowdowns the digestion thus improves quality of digestion, reduces risk of many types of cancer.

- **Selenium: -**

It is an essential trace mineral, it is micro nutrient helpful to our body; its symbol is Se & atomic no. 34.

**Main sources of selenium: -**

It is present in watermelon, fish, nuts, beef, chicken, mushroom, egg, grains, garlic etc.

**Basic pharmacokinetics of selenium (based on human intake in natural food products): -**

It is mainly absorbed in duodenum & proximal jejunum by active transport process; Dietary selenium is in 2 forms organic (selenoimethionine) it is 90% absorbed & inorganic (selenite) it is 50% absorbed; after absorption it is send in liver via portal veins, liver turns it into selenite & then is bound with selenoproteins & send into blood stream, gets in RBC, muscles, tissues etc; it is not distributed evenly in the body, liver has more of it; Vitamin E & other vitamins increases its absorption & both work as an anti-oxidant. Natural selenium remains in the body for less than 24 hours; it is stored in amino acid in skeletal muscles, little in liver, kidneys & pancreas; it is primarily excreted in urine, stool & expired in air via lungs very little in sweat & semen.

**Basic clinical pharmacology of selenium: -**

It is important for many body functions, immune system, fertility (both male & female); it contributes in thyroid hormone metabolism, DNA synthesis; it protects the body from oxidative damages & infection, it is found in tissues, skeletal muscles; it helps testies & seminal vesicles in their function; it reduces the risk of miscarriages, liver disease, cancer, asthma, cardio vascular disease; deficiency of it causes pain in muscles & joints, weaken the hair, nails, white spots on nails are found etc.

- **Lecithin: -**

It is a group of yellow-brownish fatty substances occurring in plants & animals tissues which are amphiphilic (they attract both water & fatty substances). It is an essential fat for cells of the body & important for biological functioning. It is a major component of phospholipids & constitutes a major class of lipids in body tissues & in plasma.

**Main sources of lecithin: -**

Soybean, soybean oil, fenugreek seed, egg, sunflower seed, canola, cotton seed, animal fat.

**Basic pharmacokinetics of lecithin (based on human intake in natural food products): -**

Its absorption, metabolism & excretion are yet not known & are under research.

**Basic clinical pharmacology of lecithin: -**

It reduces cholesterol, improves heart health, aids breast-feeding mothers, helps digestion, helpful in diseases like dementia, alzheimer's, soothes & moistures the skin, improves memory, helpful in gall bladder & liver diseases, depression, anxiety, skin diseases like eczema. It is converted into acetylcholine, a substance that transmits nerve impulses. It improves athletic performance, also helpful in movement disorders like parkinson's, tardive dyskinesia, sleep disorders etc.

- **Amino acids in fenugreek seeds, its oil & leaves: -**
- **Absorption & digestion of amino acid.**

When we eat high-protein foods, body breaks down protein into amino acids and peptides through digestive enzymes, such as pepsin & pancreas produces trypsin, chymotrypsin and other that aid in protein digestion.

Pepsin is the primary enzyme responsible for digesting protein; it acts on the protein molecules & breaks the bonds – called peptide bonds – that hold the protein molecules together. Next, these smaller chains of amino acids move in the stomach & then in small intestine where they're further broken down by enzymes released by the pancreas. Small intestine contains finger-like extensions called micro-villi. These structures enhance its ability to absorb dietary nutrients. Now the semi digested material pass through brush border and baso-lateral membranes of small intestine & di-tripeptides are absorbed by passive transport (facilitated or simple diffusion) or active transport (Na<sup>+</sup> or H<sup>+</sup> co-transporters) pathways. Di and tripeptides are more efficiently absorbed than free amino acids which in turns are better absorbed than oligopeptides. They're released into the bloodstream and used for various biochemical reactions.

Each amino acid has a different role in the human body. Upon absorption, some amino acids are incorporated into a new protein. Some fuel your muscles and support tissue repair. Others are used as a source of energy.

Tryptophan and tyrosine, for example, promote brain health. These amino acids support the production of neurotransmitters, leading to increased alertness and optimum nerve responses. Tryptophan also assists with serotonin production, lifting your mood and keeping depression at bay.

Phenylalanine serves as a precursor to melatonin, epinephrine, dopamine and other chemicals that regulate your mood and bodily functions. Methionine helps your body absorb selenium and zinc, two minerals that promote overall health. Some amino acids, such as isoleucine, play a vital role in hemoglobin production and glucose metabolism.

- **Tryptophan: -**

It is an amino acids (protein) that is useful in bio-synthesis of protein; it is essential in human because body cannot make it); it is a precursor of neuro-transmitter serotonin, melatonin, vitamin B3; it is a sedative also.

**Main sources of tryptophan: -**

Salmon oil, egg, spinach, milk, seeds, fenugreek seed, soy products, nuts, fish, meat, wheat, banana etc.

**Basic pharmacokinetics of tryptophan (based on human intake in natural food products): -**

It is absorbed in small intestine & reached the blood circulation, it passes the blood brain barrier & in brain cells it is metabolized into indolamine neuro-transmitter, niacin, a common example of indolamine is serotonin derivative from tryptophan. Tryptophan is converted into serotonin in the brain & body; it is

believed that tryptophan supplements should be taken with carbidopa, which blocks the blood brain barrier. (Serotonin (5HTP) 5 hydroxytryptamine, is a monoamine neuro-transmitter. It contributes in feelings of well-being, happiness, reward, learning, memory, many physiological functions).

In the pathway of tryptophan/serotonin, melatonin hormone is produced. Melatonin regulates sleep-wake cycle. It is primarily released by pineal gland in brain. It controls circadian (daily clock) rhythms.

Pineal gland releases it at night more & very little in day light. It improves immune system function.

Natural sources of melatonin are tomato, pomegranate, olive, grapes, broccoli, cucumber, barley, seeds, nuts etc.

Fructose malabsorption causes improper absorption of tryptophan in intestine thus leading to low level of it & may cause depression.

#### **Basic clinical pharmacology of tryptophan: -**

It is necessary for normal growth of infants; nitrogen balance in adults, it aids in sleep pattern, mood. It is necessary for melatonin & serotonin formation in body, it enhances mental & emotional well being, manages pain tolerance, weight etc. it also helps in build muscle tissue, essential for vitamin B3 production, relieves insomnia, reduces anxiety, depression, migraine, OCD, helps immune system, reduces cardiac spasms, improves sleep pattern etc.

- **Threonine: -**

It is an amino acid used in biosynthesis of proteins; it is an essential amino acid important for tooth enamel, collagen, elastin, nervous system, fats metabolism, it prevents fats buildup in liver, useful in intestinal disorders, anxiety, and depression.

#### **Main sources of threonine: -**

Cheese, chicken, fish, meat, lentil, black seed, nuts, soy etc.

#### **Basic clinical pharmacology of threonine: -**

It is useful in nervous system disorders, multiple sclerosis, spinal spasticity, makes bones, joints, tendons, ligament stronger, it helps the immune system, promotes heart health.

- **Isoleucine: -**

It is an amino acid that is used in the biosynthesis of proteins, it is an essential amino acid means the body cannot make it & we depend on food sources, it plays & helps many functions of the body.

#### **Main sources of isoleucine: -**

Meat, mutton, fish, cheese, egg, seeds, nuts, soybeans, milk, legumes, fenugreek seed etc.

#### **Basic pharmacokinetics of isoleucine (based on human intake in natural food products): -**

It is absorbed in small intestine by sodium-dependant active transport. It is metabolized in liver.

#### **Basic clinical pharmacology of isoleucine: -**

It promotes glucose consumption & uptake, it is anti-catabolic, enhances athletic performance & best for pre-workout, it acts on wound healing, detox of nitrogenous waste in the body, stimulates immune system, promotes secretion of many hormones, helps in hemoglobin formation, regulating blood glucose, energy in the body, built muscles, helpful to brain for its function.

- **Leucine: -**

It is branched chain amino acid (BCAA) it is ketogenic amino acid; it is necessary when we do exercise, it stimulates protein synthesis & assists in muscle building.

#### **Main sources of leucine: -**

Cheese, soybean, meat, nuts, chicken, seeds, fish, seafood, beans.

### **Basic clinical pharmacology of leucine: -**

It helps regulate blood glucose, promotes growth, recovers the muscles & bone tissues, acts on production of growth hormones, repairs the tissues, essential for muscle building, it burns fats, controls obesity, promotes lean muscles growth.

- **Lysine: -**

It is an essential amino acid, which our body cannot prepare and we need to eat it from food sources. It necessary for many body functions, acts in building blocks of protein (muscles).

### **Main sources of lysine: -**

Red meat, chicken, egg, fish, beans, lentils, wheat germ, nuts, soybeans, spirulina, fenugreek seed, shrimp, pumpkin seed, tuna, cheese, milk etc.

### **Basic pharmacokinetics of lysine (based on human intake in natural food products): -**

It is absorbed from the lumen of the small intestine into the enterocytes by active transport, it undergo first pass metabolism in liver & is metabolized in liver.

### **Basic clinical pharmacology of lysine: -**

It helps the body in tissue growth, repair muscles injury, promote collagen formation, help the body to produce enzymes, antibodies, hormones, supports immune system, its deficiency causes fatigue, irritability, nausea, hair loss, anorexia, inhibited growth, anemia, problems with reproductive system, it is very helpful in treating cold sores (herpes), control blood pressure, diabetes, osteoporosis, helps athletes performance, helpful in treating cancers, reduces anxiety, increase absorption of calcium, improves digestion & prevent leaky gut, helpful in pancreatitis.

- **Methionine: -**

It is a sulfur containing amino acid; it is essential; it plays a critical role in the metabolism & health; it act on normal cell functioning, growth & repair. It is also a chelating agent for heavy metals; due to its sulfur contain it is helpful in hair, nail health & growth & good for skin health; it reduces cholesterol by increase the production of lecithin in liver & reduces fats formation in liver, also protects kidneys, liver from hepatotoxins, it is an antioxidant. It is absorbed in lumen of small intestines into enterocytes by active transport & metabolized in liver.

### **Main sources of methionine: -**

Meat, mutton, fish, chicken, cheese, egg, beans, milk, nuts, shellfish etc.

- **Cystine: -**

It is the oxidized dimer form of amino acid, it is nonessential; the body uses it to produce taurine & other amino acids; it is a sulfur containing amino acid; our body uses vitamin B6 with the help of cystine; it heals burns, wounds, bronchitis, assist in supply of insulin, it increase level of glutathione in liver, lungs, kidneys & bone marrow. It is anti aging, anti inflammatory, anti arthritis, anti rheumatoid arthritis.

### **Main sources of cystine: -**

Meat, egg, milk, garlic, onion, broccoli, oats, wheat germ, lentils etc.

- **Phenylalanine: -**

It is an aromatic essential amino acid in human; it plays a key role in biosynthesis of other amino acids; it is important in the structure & function of many proteins & enzymes. It is precursor of melanin, dopamine, noradrenalin hormone, thyroxine hormone. It is converted in tyrosine & used in biosynthesis of dopamine & noradrenalin. It improves memory, reduces pain of hunger; it is anti depressant; it is also



a building block protein; it is useful in vitiligo, depression, ADHA, parkinson's, multiple sclerosis, pain, osteoarthritis, rheumatoid arthritis, fat burn & helpful in alcohol withdrawal symptoms.

**Main sources of phenylalanine: -**

Pumpkin seed, nuts, seeds, soy, meat, fish, chicken, egg, beans, milk etc.

- **Tyrosine: -**

It is a nonessential amino acid; it is also called as 4-hydroxyphenylalanine; it is useful in cell synthesis of protein; it is a building block protein; body prepares it from phenylalanine. It is a precursor & used to produce noradrenalin, dopamine, & thyroxin & melanin hormones. It reduces stress, improves memory, it promotes growth, mental health, skin health, fat burn. It acts as a mood elevator, anti depressant, improves memory, mental alertness, its deficiency can cause hypothyroidism leading to low blood pressure, low body temperature (hypothermia), stress, fatigue, narcolepsy; it helps thyroid gland, adrenal gland, pituitary gland to function properly. It is absorbed in small intestine by sodium-dependant active transport; after absorption it reaches the blood & crosses the blood brain barrier (BBB) & enters the brain cells & gets metabolized into catecholamine (noradrenalin). Human body regulates its amount by eating it by food sources & making inside the body (nonessential). The body does not store it much for later uses.

**Main sources of tyrosine: -**

Meat, fish, egg, milk, nuts, beans, oats, wheat, black seeds etc.

**Dopamine: -**

It regulates reward & pleasure centers in brain; it is a chemical important for memory, motor skills & etc.

**Nor-adrenaline & adrenaline: -**

These hormones are responsible for fight & flight response in stressful situation & also controls many functions of the body; it is secreted by adrenal glands.

**Thyroxin: -**

It is secreted by thyroid gland; it regulates metabolism, blood pressure, digestion, energy etc.

**Melanin: -**

It is pigmented hormone, gives our skin, hair, eye their colour; dark skinned people have more melanin in their skin than light skin people (depend on exposure to sunlight).

- **Valine: -**

It is an essential nutrient for vertebrates, biosynthesis of protein; it is an aliphatic & extremely hydrophobic essential amino acid; it is branched chain of amino acid (BCAA); it is important for growth, repair, blood glucose regulation, for energy; it stimulates CNS, proper mental function.

**Main sources of valine: -**

Cheese, soy, beans, nuts, fish, meat, chicken, mushroom, seeds, nuts, whole grains etc.

- **Histidine: -**

It is an amino acid used in biosynthesis of protein; it is semi essential amino acid, needed by human for production of histamine & also for growth & tissue repair, it is helpful in maintaining myelin sheaths that covers the nerves & protects the nerves.

**Main sources of histidine: -**

Meat, mutton, fish, milk, egg, seeds, nuts, chicken, cheese, soy, beans, whole grains, fenugreek seeds.

**Basic pharmacokinetics of histidine (based on human intake in natural food products): -**

It is absorbed in small intestine via active transport requiring the presence of sodium.

### **Basic clinical pharmacology of histidine: -**

It plays many roles in immunity, gastric secretion & sexual functions. It is also required for blood cell formation & protects tissues against damage of radiation & heavy metals. It keeps normal pH of 7 in the body, useful in rheumatoid arthritis, allergy, ulcer & anemia caused by kidney failure or dialysis. It is an antioxidant, anti inflammatory, reduces cholesterol.

- **Arginine: -**

It is among conditional essential amino acid the body needs to function properly; it is made in liver; it plays an important role in building protein thus helpful in body building.

### **Main sources of arginine: -**

Chicken, pumpkin seeds, spirulina, dairy products, red meat, fish, egg etc.

### **Basic pharmacokinetics of arginine (based on human intake in natural food products): -**

It is absorbed in jejunum mainly from oral diet.

### **Basic clinical pharmacology of arginine: -**

It releases nitric oxide in the blood & nitric oxide dilates the blood vessels thus increases the blood supply & controls high blood pressure, it improves erection, builds muscles etc. it also act on release of growth hormone, insulin & other substances in the body. It also improves heart health, athletes performance, stimulates immune system; citrulline present in watermelon is converted into arginine in kidneys, please refer lesson on watermelon.

- **Alanine: -**

It is a non essential amino acids that is present in blood plasma in its free state in high levels; it is involved in sugar & acid metabolism, protein synthesis, it increases immunity, provides energy for muscles tissues, brain & CNS, it act on tryptophan, vitamin B6 metabolism; it is an important sources of energy for muscles; it helps the body to convert simple sugar (glucose) into energy; it is produced in the body. It increases exercise capacity; reduces muscle fatigue, boost immunity, it is antioxidant; anti aging; increases muscle growth; ideal pre & post workout, reduce blood sugar, prevent liver disease, helps the liver to eliminate toxins, improves CNS functioning, helpful in benign prostate hypertrophy. It is digested in small intestine; it is converted into pyruvic acid by alanine aminotransferase-1; during fasting condition alanine derived from protein breakdown is converted into pyruvate & used to synthesis glucose by gluconeogenesis in liver, it is excreted in urine via urea cycle. It is stored little in skeletal muscles.

### **Main sources of alanine: -**

Meat, fish, egg, milk, aleovera, honey, black seeds, nuts etc.

- **Aspartic acid: -**

It is a non essential amino acid; it is over all negatively charged & plays an important role in synthesis of other amino acid, citric acid & urea cycles; it is found in animals, plants, sugarcane, sugarbeet. It may be a neurotransmitter; it strengthens the muscles, improves heart function, helps in maintaining mental health, reduces tiredness, improves athletic performance, increases muscle size, reduces depression & fatigue. It is absorbed in small intestine by active transport.

### **Main sources of aspartic acid: -**

Meat, oysters, seeds, oats, avocado, sugar beet, milk, egg, nuts, cereals etc.

- **Glutamic acid: -**

It is a nonessential amino acid. It is an excitatory neuro-transmitter; it is necessary for biosynthesis of proteins; body uses it for several key functions within the body like making other neuro-transmitters such as GABA; it promotes brain health, muscles health, intelligence, mood & mental alertness. It is called as chemical messenger. It plays an important role in body's disposal of excessive waste like nitrogen. It is absorbed in lumen of small intestine into enterocytes by active transport & excreted in urine mainly. It is almost about 2 kgs, storage in natural form in brain, kidneys, liver, muscles etc.

**Main sources of glutamic acid: -**

Meat, chicken, fish, egg, milk, wheat, mushroom, soy, broccoli, walnut, peas etc.

- **Glycine: -**

It is a nonessential amino acid that body needs for growth & maintainance of tissue & need to prepare hormones & enzymes. It is inhibitory neurotransmitter. It helps in preparing glutathione (a powerful antioxidant & reduces free radicals, delay aging). It is helpful in preparing of creatine (provides energy to muscles to perform exercise etc & acts on muscle contraction), beneficial for brain health, bone health, alzheimer's, schizophrenia, sleep disorder, stroke, burns, protects kidney & liver from harmful side effects of drugs used after organ transplant, heals wound & ulcers, it is anti inflammatory, improves skin health.

**Main sources of glycine: -**

Meat, fish, milk, legumes etc.

- **Proline: -**

It is a protein-genic amino acid used in biosynthesis of proteins. It heals cartilages, cushion joints, tendons, ligament, heart muscles, connective tissues & helps in formation of collagen.

**Main sources of proline: -**

Soy, pumpkin seed, lentils, black beans, quinoa etc.

- **Serine:-**

It is a nonessential amino acid, important for synthesis of protein, fats metabolism, muscle growth, immune system; it is a precursor of many amino acids, helpful in enzyme catalyze its reaction, overall health, physical & mental health.

**Main sources of serine: -**

Soybean, egg, lentils, meat, fish, nuts, almonds, walnut etc.





### • **Reference/research: -**

- 1) [www.britannica.com](http://www.britannica.com) › plant ›
- 2) Origin and History of the IntechOpen
- 3) [www.intechopen.com](http://www.intechopen.com) › books › origin-and-history-
- 4) <https://www.healthline.com/nutrition>
- 5) [www.tib-e-nabi-for-you.com](http://www.tib-e-nabi-for-you.com)
- 6) Hort, Sir Arthur (1916). Theophrastus Enquiry into Plants. William Heinemann. p. 107.
- 7) Abdelhafiz and Muhammad, 2008
- 8) A.T. Abdelhafiz, J.A. Muhamad Midcycle pericoital intravaginal bee honey and royal jelly for male factor infertility
- 9) Int. J. Gynaecol. Obstet., 101 (2) (2008), pp. 146-149
- 10) ArticleDownload PDF CrossRefView Record in ScopusGoogle Scholar
- 11) Ahmad, 2016
- 12) K. Ahmad Update on pediatric cough
- 13) Lung, 194 (2016), pp. 9-14
- 14) CrossRefView Record in ScopusGoogle Scholar
- 15) Akan and Garip, 2011
- 16) Z. Akan, A. Garip Protective role of quercetin: antioxidants may protect cancer cells from apoptosis and enhance cell durability
- 17) WebmedCentral, 2 (1) (2011)
- 18) WMC001504
- 19) Google Scholar
- 20) "beet". def. 1 and 2. also "beet-root". Oxford English Dictionary Second Edition on CD-ROM (v. 4.0) © Oxford University Press 2009
- 21) Trigonella foenum-graecum". Germplasm Resources Information Network (GRIN). Agricultural Research Service (ARS), United States Department of Agriculture (USDA). Retrieved 2008-03-13.
- 22) ^ Jump up to:<sup>a b c d e f g</sup> Ouzir, M; El Bairi, K; Amzazi, S (2016). "Toxicological properties of fenugreek (Trigonella foenum graecum)". Food and Chemical Toxicology. 96: 145–54. doi:10.1016/j.fct.2016.08.003. PMID 27498339.
- 23) ^ Jump up to:<sup>a b c d e f g h i j k l m</sup> "Fenugreek". Drugs.com. 2019. Retrieved 17 March 2019.
- 24) ^ Zohary, Daniel; Hopf, Maria; Weiss, Ehud (2012). Domestication of Plants in the Old World: The Origin and Spread of Domesticated Plants in Southwest Asia, Europe, and the Mediterranean Basin (4th ed.). Oxford University Press. p. 122.
- 25) ^ Cato the Elder. De Agri Cultura. p. 27.
- 26) ^ Curry A (February 2010). "A 9,000-Year Love Affair". National Geographic. 231 (2): 46.
- 27) ^ Josephus, De Bello Judaico, book 3, chapter 7, vs. 29. The prepared relish made from ground fenugreek seeds is very slimy and slippery, and was therefore poured over ladders as a stratagem to prevent the enemy's ascent.
- 28) ^ "Online Etymology Dictionary". www.etymonline.com. Retrieved 2017-02-07.
- 29) ^ V. A. Parthasarathy, K. Kandinnan and V. Srinivasan (ed.). "Fenugreek". Organic Spices. New India Publishing Agencies. p. 694.
- 30) ^ Jump up to:<sup>a b</sup> "3-Hydroxy-4,5-dimethylfuran-2(5H)-one; CID=62835". PubChem, US National Library of Medicine. 3 March 2019. Retrieved 17 March 2019.
- 31) ^ "BBC - Food - Fenugreek recipes". Retrieved 2017-02-07.
- 32) ^ "14 dishes to eat if you're a vegan in Karachi". Images. 29 March 2018. Retrieved 7 July 2018.
- 33) ^ Jump up to:<sup>a b</sup> Gall, Alevtina; Zerihun Shenkute (November 3, 2009). "Ethiopian Traditional and Herbal Medications and their Interactions with Conventional Drugs". EthnoMed. University of Washington. Retrieved January 27, 2011.
- 34) ^ "Hilba (Fenugreek paste) Cooking with chillies recipe". Cookipedia.co.uk. Retrieved 2017-02-07.
- 35) ^ This is based on the assumption that the Aramaic name רוביא corresponds to it. (Karetot 6a; Horiyot 12a) Rabbenu Nissim at the end of Rosh Hashana, citing the custom of R Hai Gaon. This follows Rashi's translation of רוביא, cited as authoritative by Tur and Shulchan Aruch OC 583:1. But Abudirham interprets רוביא as black-eyed peas.
- 36) ^ Jump up to:<sup>a b c d e f g</sup> "Fenugreek". National Center for Complementary and Integrative Health. September 2016. Retrieved 6 February 2017.
- 37) ^ McKenna, Maryn (2011-07-07). "E. coli: A Risk for 3 More Years From Who Knows Where". Wired.
- 38) ^ King, L. A.; Nogareda, F.; Weill, F.-X.; Mariani-Kurkdjian, P.; Loukiadis, E.; Gault, G.; Jourdan-DaSilva, N.; Bingen, E.; Mace, M.; Thevenot, D.; Ong, N.; Castor, C.; Noel, H.; Van Cauteren, D.; Charron, M.; Vaillant, V.; Aldabe, B.; Goulet, V.; Delmas, G.; Couturier, E.; Le Strat, Y.; Combe, C.; Delmas,

Y.; Terrier, F.; Vendrely, B.; Rolland, P.; de Valk, H. (2012). "Outbreak of Shiga Toxin-Producing Escherichia coli O104:H4 Associated With Organic Fenugreek Sprouts, France, June 2011". *Clinical Infectious Diseases*. 54 (11): 1588–1594. doi:10.1093/cid/cis255. ISSN 1058-4838. PMID 22460976.

- 39) ^ Bazzano AN, Hofer R, Thibeau S, Gillispie V, Jacobs M, Theall KP (2016). "A review of herbal and pharmaceutical galactagogues for breast-feeding". *Ochsner J*. 16 (4): 511–524. PMC 5158159. PMID 27999511.
- 40) ^ Heuzé V., Thiollot H., Tran G., Lebas F., 2018. Fenugreek (*Trigonella foenum-graecum*). Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. <https://www.feedipedia.org/node/242>
- 41) ^ Jen Chung (5 February 2019). "Happy 10-year anniversary of NYC finding the alleged source of the mysterious maple syrup smell". *The Gothamist* (New York Public Radio). Archived from the original on 8 February 2019. Retrieved 17 March 2019.
- 42) ^ Gong, J; Fang, K; Dong, H; Wang, D; Hu, M; Lu, F (2 August 2016). "Effect of Fenugreek on Hyperglycaemia and Hyperlipidemia in Diabetes and Prediabetes: a Meta-analysis". *Journal of Ethnopharmacology*. 194: 260–268. doi:10.1016/j.jep.2016.08.003. PMID 27496582.
- 43) ^ Pattanittum, Porjai; Kunyanone, Naowarat; Brown, Julie; Sangkomkamhang, Ussanee S; Barnes, Joanne; Seyfoddin, Vahid; Marjoribanks, Jane (2016). "Dietary supplements for dysmenorrhoea". *Cochrane Database of Systematic Reviews*. 3: CD002124. doi:10.1002/14651858.CD002124.pub2. PMID 27000311.

### • **Research: -**

#### **SCIENCE & HADEES REGARDING METHI (FENUGREEK): -**

##### **In light of Hadees saying that seek cure in it: -**

The chemical composition of Fenugreek seeds (Methi seeds) depicts that it contains proteins and Amino acids in such a ratio comparable to milk. Besides phosphates, it contains an organic form of iron which is easily absorbable through gastro-intestinal tract. It contains several Alkaloids but Trigonelline is an important one. The salts in it relieve the inflammation of urinary tract infections. On the basis of its chemical composition, it can be used as an expectorant. In the cases of Nephritis, when diuresis becomes least, it is a good remedy to increase diuresis. 5gm of Methi seeds powder if taken with water is highly beneficial in dysentery and diarrhoea. The lukewarm decoction of Methi seeds if taken with honey is beneficial in cough and increases urination. It is also a good appetizer and might be used in dyspepsia and anorexia. It also increases milk secretion when it is deficient.

It is a source of iron and B-complex hence can be used in general weakness. It is also reported that continuous use of Methi seeds is also significant in the treatment of hemorrhoids (piles). The recent studies show that it is a good remedy for diabetes mellitus & Fenugreek seeds are also known for their anti-diabetic property.

Several patients who were having raised blood glucose level and were treated with the formulation comprising Methi seeds; kalonji and tukhm-e-kasni improved significantly and the blood glucose level became normal. Some patients of NIDDM were also treated with Methi seeds, Berg-e-Neem and Kalonji and showed very good response. Methi seed is also useful in chronic dysentery and peptic ulcer.

They are also considered excellent to treat arthritis and to reduce blood cholesterol. They also increase breast milk production in breastfeeding mothers. Fenugreek contains natural expectorant properties and is considered ideal for treating sinus and lung congestion. It also helps in loosening and removing excess mucus and phlegm. The mucilage content of the seeds help to cure external boils, burns and ulcers.

##### **CONCLUSION OF RESEARCH: -**

1. Seek cure by using Fenugreek seeds, it worth's to purchase how much costly in may be, can be used in combination with other herbs during illness. It consists of antioxidant, anticancer, anti-diabetic, curative, preventive, healing properties.